

Highlights

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SPECIAL REPORT

Washington SCIENCE TRENDS comes to you several days early this week to bring you a special report on the implications of the new Budget in the fields of science, engineering, research and development.

Washington SCIENCE TRENDS

THE FEDERAL BUDGET

The U.S. Government expects to finance about one half of the nation's entire research and development effort according to an analysis of the Fiscal 1960 Budget presented to Congress this week.

Over \$5 billion will be spent for conduct of research and development and approximately \$388 million will be spent for research and development facilities.

These figures do not include certain Department of Defense programs amounting to about \$2 billion a year in additional expenditures. Neither do they include such expenses as science fellowships, routine testing, experimental production. More than half of the total R&D expenditures are made through contracts with private industry and through grants and contracts with universities. The remainder are made directly by Government research laboratories and other facilities.

How is this money allocated between Government Agencies and Programs?

Department of Defense has the biggest share; its programs for new and improved weapons, equipment and defense techniques account for about 68 percent of the total. Research and Development programs for the Atomic Energy Commission account for 15 percent.

R&D not connected with Pentagon or AEC "major national security programs" are estimated at \$912 million in the new budget -- or about 17 percent of total R&D expenditures.

National Aeronautics and Space Administration accounts for 30 percent of the "peaceful" R&D budget. Another 27 percent goes to the Department of Health, Education and Welfare, chiefly medical research. The remainder goes to such organizations as the Depts. of Agriculture, Interior and Commerce, the National Science Fdn., and the new Federal Aviation Agency.

Research vs. Development: About \$1.3 billion of the total R&D effort will go for research. By far the greatest amount of the total is allocated for development programs. Basic research receives about \$500 million. About \$200 million of this is divided between the Pentagon and the Space Administration.

Science and Engineering play a major role in the new budget although there are already mounting complaints from critics who contend that vital programs are ignored or short-changed. In one field alone, Astronautics, some \$830 million is proposed despite Congressional warnings that \$1 billion is required.

SUMMARY OF MAJOR PROGRAMSATOMIC ENERGY COMMISSION

Nuclear Airplane -- a major decision confirmed in the new Budget is the Administration's refusal to go ahead with construction of a nuclear airplane. President Eisenhower's explanation:

"Work will also continue, at about the same level as in 1959, on the development of a nuclear powerplant for military aircraft. Until such a powerplant is successfully developed, and the technical problems involved in operating a nuclear-powered aircraft safely are solved, there is no practical military value in attempting to build the airplane itself. It is the judgment of my scientific advisers, which I approve, that the pace of this program should continue to be geared to valid technical considerations.."

Nuclear Tests -- the budget provides for no weapons tests, in line with the Administration's offer to suspend testing pending further negotiations. However, testing grounds in Nevada and the Pacific will be kept on a standby basis.

Atomic Weapons -- No slowdown expected. Mr. Eisenhower says that "until an acceptable agreement is reached...financial authorizations must be provided to continue development and production of nuclear weapons at current high levels to meet a variety of needs...."

Basic Research -- An expanded program in physical and life sciences is proposed. Three large particle accelerators in the multi-billion electron volt range will be put into operation. More advanced experimental devices will be fabricated and operated to explore the control of thermonuclear reactions. Further investigations into the possible use of nuclear explosions for mining and earth moving under Project Plowshare will be conducted.

Health and Safety -- Administration will propose legislation to carry out recommendations of the Joint Federal-State Action Committee in the field of atomic energy, "which would recognize certain state responsibilities for the protection of public health and safety."

Reactors -- Administration promises to "pursue energetically" the promising technical approaches to civilian power reactors. Emphasis will be placed on efforts to reduce the cost of the reactor fuel cycle. Government will continue work on its experimental and prototype power reactors and will also continue "substantial support" of power reactor projects undertaken by groups outside the AEC. In the propulsion field, increased emphasis is given to the development of satellite power reactors and propulsion reactors suitable for use in destroyers. Construction of a prototype destroyer reactor is included.

Isotopes -- Emphasis is being placed on development of "practical" applications for isotopes in medicine, agriculture and industry. AEC will participate in projects with industrial and research organizations aimed at the use of isotopes and applied radiation in numerous industrial products, processes and manufacturing methods.

Funds -- Administration asks \$45 million in additional money for the current Fiscal Year. Of this supplemental request, \$21 million will be for accelerating development of the technology of manned space flight and \$24 million for equipment and facilities for propulsion development and tracking. For Fiscal 1960 the Administration asks \$485 million, an increase of \$135 million.

Space Research -- Plans for this year and next include "an extensive program of scientific investigations in space." Satellites, lunar probes and deep space probes will be used to increase understanding of the earth's outer atmosphere; the medium of space; the moon and the planets; the earth's gravitational and magnetic fields; radiation from space and other phenomena.

Applied Research -- Preliminary studies will be made looking toward future development of an orbiting space laboratory. Programs in the field of meteorology "will look toward the establishment of a worldwide system of satellite weather observation and in the field of communications experiments will continue with the use of satellites to serve as relays for the intercontinental transmission of messages, voice and television."

Space Technology -- Administration expects "an early and substantial increase" in the capability to place very heavy objects in space. Projects include high energy fuel rockets, a million pound thrust single chamber engine and a nuclear rocket engine, in cooperation with AEC.

Research Facilities -- Projects underway or planned for support include initiation of a Space Projects Center to be located at Beltsville, Md.; extension of the capabilities of the Pilotless Aircraft Station at Wallops Island, Va. to accommodate launching of space vehicles; improvement of tracking networks and establishment of space propulsion development and test facilities. Additions to the Space Projects Center planned for Fiscal 1960 include a central flight control and operations facility, a space sciences laboratory and an instrument laboratory.

Miscellaneous Projects -- Other new projects planned for 1960 include special equipment for the X-15 research aircraft program; a facility for applied research in the problems of ion and plasma propulsion of spacecraft; and establishment of launching facilities at the Pacific missile range of the Department of Defense.

FEDERAL AVIATION AGENCY

Research -- A research and development budget of \$47 million is aimed at development and selection of systems, procedures, facilities and devices which will best serve aviation needs and promote maximum coordination of air traffic control and air defense systems. Projects include continued study of the present airways system and projections of future requirements, theoretical systems analysis of proposed facilities, development and testing of an automatic data processing and display system, long-range development of data processing techniques and participation in development of an aviation weather system. Program also reflects work on aeronautical instruments and equipment and on human problems relating to aircraft design and operation.

Missiles -- Administration plans a 50-percent increase in funds for Titan ICBM and 40 percent more for the solid-fuel Minuteman ICBM. Additional funds are also requested to complete program for production of Jupiter and Thor but no future procurement is planned unless allied nations require these IRBM's. The solid fuel Pershing and Sergeant missiles will replace the liquid fuel Redstone and Corporal. As previously reported, Regulus II, intermediate range air-breathing missile is canceled as is the Rascal air-to-ground missile and the Goose De-coy missile. Major Navy effort will be solid-fuel Polaris, a sea-launched IRBM. Atlas ICBM expected to be operational this summer.

Army Nike-Hercules will come into increasing use. Research will be stepped up on an antiballistic missile system -- the Nike Zeus. "Considerable" operational capability is forecast for the Bomarc ground-to-air missile. Hound Dog air-to-surface missile will be added to the B-52 long-range bomber force. Army will increase the number of battalions armed with Hawk guided missile for defense against low-flying aircraft.

Navy Programs -- First Polaris submarine will go into operation during Calendar Year 1960. Construction of six are underway and three more will be started. Seamaster jet seaplane will be stopped. By June 30, 1960 Navy will have 5 Forrestal class carriers with three more under construction. No new nuclear carrier is requested. Conversion of eight cruisers to guided missiles armament is expected, with five more under construction or conversion including first nuclear-powered cruisers. Five guided missile destroyers and frigates will be in commission, with a large number under construction, including first nuclear frigate. Major efforts will be devoted to research, development and procurement for antisubmarine warfare, including "significantly better" Sonar detection equipment, a drone helicopter program and modification of anti-submarine attack aircraft.

Army Programs -- Army will have four missile commands and three field artillery missile groups. Gun battalions will continue to be replaced by more effective surface-to-air missile units. Active aircraft inventory will be up by nearly seven percent. Over 70 Nike battalions will be in operation by the end of the Fiscal Year. Tank and truck procurement will increase. Army will buy more turbo-prop observation planes but fewer helicopters.

Air Force Programs -- Wings will be cut "modestly" from 105 to 102. Administration says this will be offset by further "Century" series aircraft and Bomarc step-up. Procurement of B-52 and B-58 bombers will increase, as well as KC-135 jet tankers. However, no interceptors and fewer fighter-bombers will be purchased. Increased funds are asked for development of the B-70 jet bomber and for development of a new high-speed long range interceptor system utilizing the F-108.

Electronics and Communications -- Administration asks a "substantial" increase for these programs. Much of the money will go into the air defense system for equipment to detect enemy aircraft and missiles and to guide air defense weapons to targets. Additional sectors of the Sage, semi-automatic ground environment system will go into operation and the accelerated rate of procurement for the BMEWS ballistic missile early warning system will continue. These two air defense systems will take one-third of the 1960 electronics and communications procurement funds.

General Research and Development -- Funds for research and development by or for the PHS and NIH are estimated at some \$236.5 million, compared with an estimated \$224.3 being spent this year. Dental research and grants for construction of medical and dental research facilities are unchanged. Every other major program is increased.

About 25 percent of PHS expenditures in research is for research undertaken in Government laboratories. The balance is for grants to universities, hospitals and other research centers for medical research in the causes and cure of diseases and for related basic research in the life sciences.

Long-Term Objectives -- President calls for a "careful appraisal" of the impact of the sharply expanded Government programs of the past few years, particularly the effect upon medical schools and research institutions. He says Secretary Flemming is completing "a review of our long-term objectives in the field of medical research and training" which will be made available to Congress. The study details programs and costs, "including indirect costs."

Training Programs -- Administration recommends extension of programs for training of professional nurses and for graduate training of public health personnel. Laws authorizing these programs expire June 30, 1959.

Public Health Problems -- Administration recommends increases for air pollution control, radiological health and communicable disease activities. In addition, \$1 million is requested for special grants to schools of public health, as authorized by the last Congress. About \$1.5 million in special emergency funds is requested for the current Fiscal Year to aid in newly developed techniques of heart surgery, particularly for children.

Food and Drug -- Appropriations of \$13 million, a \$1 million increase, is requested to implement new legislation regulating chemical additives in foods. Food and Drug Administration is permitted to augment its staff of scientists and inspectors.

Construction -- Construction is expected to begin late this year on a National Library of Medicine, a Dental Research building and a general office building at the NIH, Bethesda, Md. Additional money will go for a new biologics standards building and new surgical facilities.

NATIONAL BUREAU OF STANDARDS

Intensified Research -- Administration requests \$5 million in additional funds to permit intensified research on high temperature, high pressure and high purity phenomena. Funds are also provided to enlarge facilities at the Bureau's Boulder, Colo. laboratory.

WEATHER BUREAU

Expanded Services -- Administration asks additional financing to improve weather services to aviation, permit continuation of hurricane research and procure additional meteorological apparatus.

Specialized Facilities -- Administration asks financial support for National Science Foundation programs which aid basic research by providing for construction and maintenance of specialized facilities for scientific experimentation and investigation. These include radio and optical astronomy observatories, a solar research telescope, reactors for nuclear research, university computers, and an oceanographic research vessel. Support is also provided for specialized biological laboratories and for an experimental program to aid graduate laboratories in universities.

SCIENCE TRAINING PROGRAMS

Education -- National Science Foundation will have some \$67 million in new financing in 1960 for programs designed to interest more young people in science careers; to improve courses and methods of teaching; to supplement training of science and mathematics teachers and similar projects. Department of Health, Education and Welfare will have some \$57 million for the second year of a four year program to assist local schools in equipping and remodeling laboratories.

Research Assistants -- Administration estimates that some 20,000 to 30,000 graduate students will be employed as research assistants in 1960 under Federal research and development grants and contracts to educational institutions.

Fellowships -- Public Health Service expects to award about 1,200 fellowships in 1960, chiefly for predoctoral and postdoctoral study in the life sciences. National Science Foundation will have about 1,600 fellowships for predoctoral and postdoctoral study in the sciences, with emphasis on training in the natural sciences. An estimated 1,300 high school teachers and college teaching assistants will receive Foundation fellowships for summer study in the sciences. About 1,000 students will be aided under a new program of cooperative graduate fellowships to be administered with the assistance of participating colleges and universities.

Specialized Fellowships -- These fellowships and traineeships are awarded by the Federal Government primarily for individuals who have completed their basic professional education. Health, Education and Welfare will award about 2,400 specialized fellowships and traineeships for graduate study, primarily in medical specialties. Atomic Energy Commission will aid about 375 graduate students in such fields as reactor technology, radiological physics, and in industrial health and medicine.

Training Grants -- Grants made to or through institutions are primarily for purpose of establishing, expanding, improving or continuing programs of training in the sciences. Largest program is conducted by the National Institutes of Health, with some \$50 million for undergraduate and graduate training. Vocational Rehabilitation grants will total \$6 million. Atomic Energy Commission will have about \$5 million to assist non-profit educational institutions acquire teaching aids, demonstration apparatus and educational reactors.

Science Teaching Aids -- A variety of other programs are administered by Government Agencies to aid in science education projects. For example, some 27,000 teachers will be assisted under various programs providing institute training for teachers - a \$33 million item in the new budget. This does not include schools and courses sponsored by such Federal Agencies as the Atomic Energy Commission, or a \$17 million series of specialized projects in science education.

